32692
Customer Number

Patent
Case No.: 57135US002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	KRECH, JOHN E.		
Application No.:	09/990601	Confirmation No.:	3879
Filed:	November 21, 2001	Group Art Unit:	1772
Title:	PLASTIC SHIPPING AND STORAGE CONTAINERS AND COMPOSITION AND METHOD THEREFORE		

AMENDED BRIEF ON APPEAL

Mail Stop: Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the December 4, 2006 Notification of Non-Compliant Appeal Brief, Appellant submits this Amended Appeal Brief in compliance with 37 CFR § 41.37, replacing the Appeal Brief previously filed on September 7, 2006.

This is an appeal from the Office Action mailed on March 7, 2006, in light of the Advisory Action mailed June 20, 2006, finally rejecting claims 30, 32-37, 46-53 and 55-65.

☐ Please charge the fee provided in 37 CFR § 41.20(b)(2) to Deposit Account No. 13-3723. One copy of this sheet marked duplicate is also enclosed.

☐ Any required fee will be paid at the time of EFS-Web submission.

☒ If necessary, charge any required fee, or credit any overpayment to Deposit Account No. 13-3723.

A Notice of Appeal in this application was filed and received by the USPTO on June 7, 2006.

Appellants request the opportunity for a personal appearance before the Board of Appeals to argue the issues of this appeal. The fee for the personal appearance will be timely paid upon receipt of the Examiner's Answer.

(B) TABLE OF CONTENTS

(A) Identification – page 1

(B) Table of contents – page 2

(C) Real party in interest – page 3

(D) Related appeals and interferences – page 3

(E) Status of claims – page 3

(F) Status of amendments – page 3

(G) Summary of claimed subject matter – pages 3-4

(H) Grounds of objection and rejection to be reviewed on appeal – pages 4-6

(I) Argument – pages 6-22

(J) Claims appendix – pages 23-29

(K) Evidence appendix – pages 30-37

(L) Related proceedings appendix – page 38

(C) Real Party In Interest

The real party in interest is 3M Company (formerly known as Minnesota Mining and Manufacturing Company) of St. Paul, Minnesota and its affiliate 3M Innovative Properties Company of St. Paul, Minnesota.

(D) Related Appeals And Interferences

Appellants are unaware of any related appeals or interferences.

(E) Status of Claims

Pending: 30, 32-37, 46-53, and 55-65

Canceled: 1-29, 31, 38-45, and 54

Claims appealed: 30, 32-37, 46-53, and 55-65

(F) Status of Amendments

An amendment dated June 06, 2006 was filed after the final rejection. The amendment has been denied entry.

(G) Summary Of Claimed Subject Matter

(PAGES AND LINES RELATE TO SPECIFICATION, AS FILED, UNLESS OTHERWISE STATED)

CLAIM 30

Independent claim 30 and claims directly and indirectly dependent thereon concern a plastic pallet (FIG. 1 (10) and page 15, lines 1-17, and page 5, line 1, in the specification, as filed) and polymeric compositions useful for producing it (page 1, lines 6-7). More particularly, the plastic pallet (page 5, line 1) comprises a composition of matter including specified amounts of (a) one or more of polyolefin resins and blends thereof, and (b) one or more thermosetting resins (page 2, lines 26-29), the resin being non-halogenated (page 3, line 15); the plastic pallet composition further comprising only non-halogenated flame retardants (page 13, lines 19-21).

CLAIM 62

Independent claim 62 relates to the plastic pallet (FIG. 1 (10)) as described in the summary of independent claim 30 above, except that the polyolefin and thermosetting resins are more broadly defined (page 2, lines 28-29). The plastic pallet further comprises an antimicrobial additive that is integrally associated with the pallet (page 20, lines 21-23) and is substantially insoluble in water (page 6, lines 18-20). Specific antimicrobial additives are named in the claim (page 19, lines 30-31 and page 22, lines 14-15).

CLAIM 63

Independent claim 63 relates to the plastic pallet (FIG. 1 (10)) as described in the summary of independent claim 30 above. The plastic pallet is further defined and comprises a thermal curative or a photocatalyst (page 10, lines 18 and 22).

CLAIM 64

Independent claim 64 relates to the plastic pallet (FIG. 1 (10) as described in the summary of independent claim 30 above, except the thermosetting resin is defined as an epoxy resin (page 7, lines 22-23). The plastic pallet is defined as a molded pallet (page 4, line 15) comprising in-mold applied friction material laminated adhesive-free to at least one surface of the pallet (page 5, lines 1-3 and lines 28-29, page 14, lines 28-31, and page 19, lines 2-3).

CLAIM 65

Independent claim 65 relates to the plastic pallet FIG. 1 (10) as described in the summary of claims 30 and 63 above. The plastic pallet is defined as comprising one or more molded members (FIG. 1, and any of (2, 4, 8, 12, and page 15, lines 1-17)) comprising in-mold applied friction material on at least one surface of the molded members (page 14, lines 28-31 as well as page 5, lines 1-3 and lines 28-29, and page 19, line 3.

(H) Grounds of Objection and Rejection to be Reviewed on Appeal

Specification Objection -35 U.S.C. 132(a)

Ground of Objection

The specification is objected to under 35 U.S.C. 132(a) because it is alleged new matter has been introduced into the specification by amendment of claim 64.

Claim rejection - 35 U.S.C. 112, first paragraph

Ground of Rejection

Claim 64 stands rejected under 35 U.S.C. 112 (first paragraph) for allegedly failing to comply with the written description requirement.

Claim Rejections - 35 U.S.C. 103(a)

1) First Ground of Rejection

Claims 30, 32, 34-37, 47, 50-53, 55, and 57-61 have been rejected under 35 U.S.C. 103(a) over Oishi et al. (US 5,744,504) in view of Endo et al. (US 6,344,508).

2) Second Ground of Rejection

Claim 33 stands rejected under 35 U.S.C. 103(a) as purportedly being unpatentable over Oishi et al. in view of Endo et al. and further in view of Perez et al. (US 5,709,948), and in further view of Angell, Jr. (US 3,268,636)

3) Third Ground of Rejection

Claim 46 stands rejected under 35 U.S.C. 103(a) as purportedly being unpatentable over Oishi et al. in view of Endo et al. and in further view of Radican (US 6,148,291).

4) Fourth Ground of Rejection

Claims 48 and 64 stand rejected under 35 U.S.C. 103(a) as purportedly being unpatentable over Oishi et al. in view of Endo et al. and in further view of Juhanson (US 4,655,360).

5) Fifth Ground of Rejection

Claim 49 stand rejected under 35 U.S.C. 103(a) as purportedly being unpatentable over Oishi et al. in view of Endo et al. and further in view of Radican and in further view of Juhanson.

6) Sixth Ground of Rejection

Claims 56 and 63 stand rejected under 35 U.S.C. 103(a) as purportedly being unpatentable over Oishi et al. in view of Endo et al. and in further view of Perez et al.

7) Seventh Ground of Rejection

Claim 62 stands rejected under 35 USC 103(a) as purportedly being unpatentable over Oishi et al. in view of Endo et al. and further in view of Ueeda et al. (US 4,604,441) and further in view of Dyckman et al. (US 3,979,354).

8) Eighth Ground of Rejection

Claim 65 stands rejected under 35 USC 103(a) as being unpatentable over Oishi et al. in view of Endo et al. and in further view of Juhanson.

(I) ARGUMENT

Specification Rejection under 35 U.S.C. 132(a)

The specification is objected to under 35 U.S.C. 132 because it is alleged that new matter was introduced into the specification through amendment of claim 64. More specifically, the alleged new matter is: "epoxy resins comprising 1 to 49 parts by weight of a curable epoxy resin" in claim 64. Appellants disagree with the Objection and submit that the aforementioned language is supported in the application as originally filed.

The specification (as filed) provides at least the following clear, express support for the language in claim 64:

(a) support for "one or more of thermosetting resins" being included in the composition is provided on page 2, line 29;

(b) support for "1 to 49 parts by weight of a curable thermosetting resin" being used in the invention is provided on page 3, lines 17-18; and

(c) support for the "curable thermosetting resin" including "epoxy resins" is provided on page 7, line 23 and page 8, line 22.

Additionally, many, useful epoxy resins are disclosed in the specification, for example, on p. 8, line 22 to page 9, line 32 and the specification provides the following additional support for the language added to claim 64: page 2, line 29, page 3, lines 15-18, page 5, line 22-23 and 28-29, page 7, line 23, page 8, lines 5-9, page 8 line 22 to page 9, line 32, page 13, lines 19-21, page 14, lines 28-31, page 15, lines 24-29, and page 18, line 32 to page 19, line 6.

Clearly, the specification supports the use of one or more thermosetting resins and that such resins can be epoxy resins. It logically follows that epoxy resins may be used at the same

levels as the thermosetting resins in the invention. Hence, the specification (including pending claim 64) is fully supported by the specification as filed and the objection should be withdrawn.

Claim Rejection under 35 U.S.C. 112 (first paragraph)

Claim 64 stands rejected under 35 USC 112, first paragraph, as purportedly failing to comply with the written description requirement. It was alleged that the language: "epoxy resins comprising 1 to 49 parts by weight of a curable epoxy resin", in claim 64, is not supported by the original disclosure. Although Appellants objected to the rejection, they submitted an amendment to claim 64 in their Response to the Final Action (June 6, 2006) to facilitate prosecution. However, the amendment was not entered.

The test for determining compliance with the written description requirement of 35 U.S.C. 112, first paragraph, is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession of the claimed subject matter. The application is not required to contain language that corresponds, word-for-word to the claim language (see *Ex parte Harvey*, 3 U.S.P.Q 2d 1626 (B.P.A.I. 1986)). As already argued in the context of the objection under 35 USC 132(a), the application contains ample support for the language added to claim 64. So it is clear from such support that Appellants were in possession of the claimed subject matter at the time the application was filed and that pending claim 64 complies with the written description requirement. Thus, Appellants respectfully submit that claim 64 is in proper form for appeal, is in proper condition for allowance and request withdrawal of this rejection.

Rejections under 35 U.S.C. 103(a)

Wooden and metal pallets have certain deficiencies such as being heavy, bulky, expensive to maintain, subject to deterioration due to exposure to the elements, they may be infested by insects, and have fastening means that can deteriorate over time. Plastic pallets are known and overcome many of the aforementioned problems of wooden and metallic pallets, but they have certain deficiencies, such as melting and flowing under high heat or fire resulting in molten plastic spreading heat and fire, they are prone to slippage, and they can be microbially contaminated.

Appellants' invention overcomes these deficiencies because their plastic pallets are made from compositions that combine polyolefin and halogen-free thermosetting resins and contain

non-halogenated flame retardants (see page 13, lines 19-21 of the specification). These compositions help eliminate the risk of hazardous or toxic gases being emitted from the pallets when they are subjected to high heat (e.g., fires). The thermosetting resins can be added to the pallet compositions in an uncured state thus advantageously reducing viscosity of the composition and permitting lower processing temperatures and avoiding degradation of the flame retardant and optional antimicrobial and blowing agent additives (see page 6, lines 25-32 of the specification). Additionally, the present invention can exhibit the following desirable characteristics: increased fire resistance, increased coefficient of friction to reduce slippage and damage, increased surface energy for improved bonding, improved control of thermal expansion and thermal deflection, reduced microbial contamination (see page 6 lines 9-20 of the specification), improved chemical resistance, improved resistance to UV and oxidative degradation, and easier manufacture due to reduced viscosity, pressure, temperatures, and equipment size requirements (see specification, page 5, lines 9-17). Also after foaming the polymeric composition used to make the pallets, cure of the thermoset provides improved mechanical properties to the pallet such as flexural modulus, impact strength, tensile strength and compressive strength (see page 7, lines 10-16 of the specification).

Appellants will show that their invention is a novel and unobvious plastic pallet. Appellants will show that the primary and secondary references cited against the claims fail to teach, suggest or enable the invention and that the tertiary references cited for additional "bits and pieces" do not overcome this essential failure. Although each of the grounds of rejection presented by the Examiner and argued by Appellants during prosecution are discussed separately herein, all rejections rely on interpretation and application of US 5,744,504 (Oishi et al) in view of US 6,344,508 (Endo et al), and all arguments pertaining to these references in the section entitled "First Ground of Rejection" apply to the other 35 USC 103(a) Grounds of Rejection argued in this Brief and are incorporated by reference.

1) First Ground of Rejection

Claims 30, 32, 34-37, 47, 50-53, 55, and 57-61 were rejected under 35 U.S.C. 103(a) as being unpatentable over Oishi et al. (US 5,744,504) in view of Endo et al. (US 6,344,508).

The rejected claims all relate to plastic pallets comprising compositions that include a blend of particular polyolefins and thermosetting resins in specified amounts and with specified

properties (e.g., degree of polymerization, crosslinking, and functionalization). The resins are free of halogen and also contain non-halogenated flame-retardants.

Oishi et al. relates to certain diguanamines compounds, their process of preparation, and certain derivatives and uses thereof. The diguanamines are purported to have many desirable properties (including use as flame-retardants) and to be useful in resin compositions. Various resin compositions are disclosed. Notably, halogenated compounds can be used to prepare the diguanamines (see Oishi et al., for example, at col. 7, line 27 and col. 8, lines 54-55 and 66-67) and a considerable number of resins alleged as useful thermoplastic resins in Oishi et al. are halogenated (see, for example, col. 29, lines 40 – 49).

Oishi et al. describes three "Invention Groups" (e.g., col. 1, line 19), specifically, the "First Invention Group" (col. 1, line 47 to col. 17, line 46); "Second Invention Group" (col. 17, line 47 to col. 56, line 47); and "Third Invention Group" (col. 56, line 48 to col. 69, line 35). Each Invention Group includes particular formulations containing diaguanamine materials and each Invention Group has its own uses or applications. Oishi et al. separates its teachings about how to prepare and use the resin compositions of each Invention Group and does not teach or suggest that the compositions from one Invention Group can or should be used in an application recommended for another Invention Group. Despite that lack of teaching or suggestion, the Examiner combined teachings about Oishi et al's Second Invention Group compositions with uses intended for the Third Invention Group without offering any rationale or motivation. Appellants have maintained that such interpretations of Oishi et al are improper because they fail to fairly interpret Oishi et al's teachings as a whole.

Endo et al. (US 6,344,508) relates to reclaimed PET (polyethylene terephthalate) and polylactone resin compositions and molded articles thereof, and flame-retardant resin compositions and molded article thereof. These compositions are based on thermoplastic resins, so Endo et al does not disclose, teach or suggest the use of blends of polyolefins and thermosetting resins, or the selection of the particular types of resins used in Appellants' invention. Additionally, Endo et al. includes certain flame-retardants that can be bromine- or chlorine- based (col. 3, lines 12-15), and certain thermoplastic resins that are halogenated (e.g., col. 7, lines 53-56), so it also does not teach the use on non-halogenated flame retardants and resins (which is also deficiency of Oishi et al).

During prosecution, Appellants argued at length why one cannot read the Oishi et al disclosure about Second Invention Group compositions to disclose, teach or suggest compositions comprising polyolefin and thermosetting resins. Appellants still maintain that the Examiner's reading of the reference is in accurate. However, even if Oishi et al. can be interpreted to teach or suggest a blend of thermosetting and polyolefin resins there is clearly no disclosure how to select (from the many resins listed) the polyolefin resins and thermosetting resins (e.g., degree of polymerization and level of cross linking, relative amounts of resins, halogen-free resins) used in Appellants' invention. There also is no teaching to use only halogen-free flame retardants. Endo et al, which teaches only the use of certain thermoplastic resins, including halogenated resins, and halogenated flame retardants, does not cure the deficiencies of Oishi et al's teachings with respect to compositions. Hence, Oishi et al simply does and cannot teach, disclose or enable Appellants invention and Endo et al does not cure those deficiencies.

The Examiner acknowledged in the Final Rejection (March 7, 2006) (at page 10, first full paragraph) that the Oishi et al teaching with respect to its compositions was deficient, but the only explanation offered for why this deficiency should not fail was that it would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the relative amounts of the polyolefin and "epoxy" resins in the blend depending on the particular desired end result in the absence of unexpected results (see Final Rejection at page 5, first full paragraph, and page 11, first full paragraph). That statement is based on hindsight and cannot be a substitute for offering a clear teaching, suggestion or motivation to modify the Oishi et al compositions. It completely ignores the fact that specific selections must still be made to arrive at Appellants' invention and that those selections are not disclosed, taught, suggested or enabled by Oishi et al with or without Endo et al. In fact, because of the very long list of possible resins and resin combinations taught by Oishi et al for the Second Invention Group, modifying the Oishi et al teachings according to the Examiner's suggestion would require undue experimentation because neither Oishi et al nor Endo et al provide any guidance to one of ordinary skill about how (or why) to select the resins and combine them the way Appellants do. Silence in a reference is not the equivalent to a teaching (*In re Burt*, 53 C.C.P.A. 929, 935 (1966). Thus, Oishi et al does not teach, disclose, suggest or enable the compositions used in Appellants' invention, and Endo et al

does not cure those deficiencies. Appellants respectfully submit that for these reasons alone the Examiner has failed to make a prima facie case of obviousness based on Oishi et al and Endo et al and that this rejection should fail.

Although the Oishi et al compositions are allegedly fire retardant, they are very different from the compositions employed by Endo et al. Given the impact such differences could have on handling of such compositions or the final properties of products made from the compositions, it is unlikely that one of ordinary skill in the art would even think it was reasonable to substitute the Oishi et al compositions for those employed by Endo et al to make the Endo et al articles. Because there was no motivation, suggestion or teaching within Endo et al or Oishi et al to justify combination of the teachings of these references, the Examiner relied on language in Appellants' application describing Appellants' invention to combine Endo et al and Oishi et al. However, the language in Appellants' application is not prior art nor an admission, so it cannot be used against Appellants to support a rejection. For this additional reason, the Examiner's prima facie obviousness case based on Oishi et al and Endo et al should fail.

Even if the hindsight-based combination of the Oishi et al and Endo et al teachings could somehow properly be justified, their combined teachings would not render Appellants' invention obvious because the combined teachings of Oishi et al and Endo et al do not teach, suggest, disclose or enable the compositions used to make Appellants' invention. In addition to the deficiencies already enumerated above, neither Endo et al nor Oishi et al. teaches or suggests the use of compositions comprising non-halogenated resins and non-halogenated flame retardants. Despite the fact that Oishi et al. touts the flame retardancy of its diguanamines and that some Second Invention Group Compositions are flame retardants (see, e.g., Oishi et al at col. 17, lines 50-60), it does not teach that non-halogenated resins and flame retardants should be used. Instead Oishi et al teaches the use of many halogenated thermoplastic resins (see, for example, col. 29, lines 27 and 40-49) and even that its diguanamines can be prepared using halogenated compounds (see, for example, col. 7, line 27 and col. 8, lines 54, 55, 66, and 67, and line 66). Other halogenated components for Second Invention Group compositions are also disclosed, for example, at col. 24, lines 43-46. As already noted, Endo et al teaches that its compositions may contain halogenated resins and halogenated flame retardants. Thus, both Oishi et al and Endo et al entirely failed to appreciate the advantages of making an article (or even a flame retardant

composition) using both halogen-free resins and halogen free flame retardants. Not only does this example illustrate the deficiency of the Oishi et al and Endo et teachings, but it shows that the references teach away from Appellant's invention, which supports the unobviousness of Appellants' invention over Oishi et al. and Endo et al.

Thus, Appellants respectfully submit that this rejection should be withdrawn not only because the Examiner has failed to establish a proper basis for combining the cited references and failed to establish a proper prima facie case of obviousness, but also because the combined teachings of the references do not teach, disclose, suggest or enable the Appellants' invention and teach away from Appellants' invention.

In addition to the arguments presented above the following dependent claims (32, 34-37, 47, 50-53, 55, and 57-61) are also patentable for the following reasons.

Additional embodiments are claimed by dependent claims 32 34-35, 37, 47, 50-51, 55, 59 and 60 for example, embodiments including an effective amount of friction material on at least one surface thereof (specification as filed, page 2, lines 26-31), and embodiments containing various adjuvants (for example, on page 13, lines 4 – 14, of the specification). A particularly novel embodiment includes pallets having friction material applied to a surface of the pallet by "in-mold" lamination that is adhesive-free (page 5, lines 28-29, and page 19, lines 2-6, for example).

Claim 32 relates to the plastic pallet of claim 30 where the thermosetting resin is an epoxy resin selected from a specified group. The Examiner stated that it would be obvious to select an epoxy resin from the many thermosetting resins disclosed in Oishi et al, however, he has offered no reason for this conclusion nor has he taken into account the many thermoset resins one of ordinary skill in the art would have to consider and test before choosing an epoxy resin from the resins disclosed by Oishi et al. So in addition to the reasons given above, this rejection is improper because it is based on hindsight and would require undue experimentation to modify the prior art compositions to arrive at the compositions used in Appellants' invention.

Claim 34 relates to the plastic pallet of claim 30 further comprising certain fillers, i.e., bubbles, glass fibers, and glass beads. The Office Action (March 7, 2006, on page 5, bottom paragraph) alleges that Oishi et al. "teach that the container comprises glass beads as a filler (col. 32, lines 51-52 and col. 32, line 67 – col. 33, line 2)". The cited text relates to a Second

Invention Group composition and Oishi et al does not teach that these compositions are useful for "containers" as alleged by the Examiner. Appellants respectfully submit that this rejection is improper because Oishi et al cannot be fairly construed to disclose what the Examiner purports it discloses.

Claim 35 relates to the plastic pallet of claim 30 further comprising an antimicrobial additive. The Final Rejection (March 7, 2006 on page 5, bottom paragraph) states that the diguanamines taught by Oishi et al. are antifouling agents (col. 3, lines 43-45). The paragraph in Oishi et al. containing this disclosure discusses the excellent weatherability of diguanamines, including water-proofness. Neither Oishi et al or Endo et al define "antifouling agents" to be antimicrobial. Thus, these references do not teach, suggest or disclose the use of antimicrobial additives in plastic pallets.

Claim 37 relates to the plastic pallet according to claim 30 further comprising non-halogenated flame-retardants present in a specified range. As already noted, neither Oishi et al nor Endo et al teach, disclose or suggest use of non-halogenated flame-retardants, so recitations of the relative amounts of such materials to be used in a pallet can only further distinguish claim 37 over Oishi at al. and Endo et al.

Claim 47 relates to the plastic pallet according to claim 30 further comprising certain performance enhancement additives, i.e., friction material, antimicrobial additives, mildewcides, foaming agents, and fillers. The Final Rejection (March 7, 2006 on page 6, lines 6-7) states Oishi et al. teaches that the container comprises a filler and cites col. 32, lines 61-52 and 67. It is respectfully submitted that the Examiner has misconstrued Oishi et al because the cited text relates to the Second Invention Group and Oishi et al does not teach that such compositions should be used for "containers". Furthermore, some of the claimed additives are not even disclosed or suggested by Oishi et al or Endo et al.

Claim 50 relates to the plastic pallet according to claim 30 further defining the group of prepolymerized, uncrosslinked hydrocarbon and functionalized polyolefin resins used. There is not disclosure, teaching or suggestion in either of the cited references to enable the selection of the polyolefin resins of claim 50 and it would require undue experimentation for one of ordinary skill in the art to arrive at such selections based on the disclosures of Oishi et al and Endo et al.

Claim 51 relates to the plastic pallet according to claim 47 wherein the performance enhancement additives are present in the range of more than 0 to 70 parts by weight of the weight of the total composition. The Final Rejection (March 7, 2006, on page 6, lines 10-13) urges that the Oishi et al. reference in col. 32, lines 51-54 teaches that "a filler can be incorporated as needed to an extent that does not impair the advantageous effects of the invention" and this **overlaps with the claimed range of "more than 0 to 70 parts by weight"** of the present invention (emphasis added) The Examiner's conclusion is unsupportable. Oishi et al provides no guidance about how to select the additives and additive levels used in Appellants' invention. Some of the claimed additives are not even disclosed by Oishi et al or Endo et al. Furthermore, Oishi et al and Endo et al do not teach or suggest the use of Oishi et al's compositions in a plastic pallet, much less how to achieve the compositions used to make Appellants' plastic pallet, so how would one skilled in the art apply Oishi et al's teaching to "incorporate filler as needed to an extent that does not impair the advantageous effects of the invention" to achieve Appellants' invention? Silence in a reference is not a teaching and there is a clear failure of Oishi et al and Endo et al to disclose, teach, suggest or enable the embodiment claimed in claim 51.

Claim 59 relates to the plastic pallet according to claim 30 comprising a semi-interpenetrating polymer. The Final Rejection (March 7, 2006, page 7, lines 1 and 2) alleges "the blend of a polyolefin resin and a thermosetting resin taught by Oishi et al. is a semi-interpenetrating polymer network since the polyolefin resin is uncrosslinked and the thermosetting resin, by definition, is crosslinked". That statement is not supported by the cited references. A semi-interpenetrating polymer network is not a simple "blend" of polymers. As described in the application on page 6, lines 1-3, a semi-interpenetrating polymer network requires that at least one polymer is crosslinked and at least one polymer is uncrosslinked. Upon curing of the thermosetting resin in the presence of the uncrosslinked polyolefin resin, a semi-interpenetrating polymer is formed. This produces a true network comprising crossover points, such as that described in Sperling, L. H., INTRODUCTION TO PHYSICAL POLYMER SCIENCE, John Wiley and Sons, Inc. New York (1986) pages 46-47 (copy attached, Appendix (K)). As stated on page 47 of the Sperling reference, one of the polymers is polymerized or crosslinked in the immediate presence of the other. The use of semi-interpenetrating polymer networks is not disclosed, taught, suggested or enabled by Oishi et al. or Endo et al.

Claim 60 relates to the plastic pallet of claim 35 (claim 35 being dependent on claim 30) where the antimicrobial additive is integrally associated with the pallet and is substantially insoluble in water. The Final Rejection (dated March 7, 2006 on page 7, lines 4-9) alleged that the prior art container is formed from a composition containing diguanamine and the diguanamine is substantially insoluble in water as shown by the large "n" value of the ammonium polyphosphate as taught in col. 24, lines 16-24. However, a careful reading of Oishi et al shows that the reference only says that phosphorus-containing compounds can be used in combination with the diguanamines in the resin of Oishi et al. (col. 23, lines 37-43), and the teaching with respect to "n" in col. 24, lines 16-20, refers to the polyphosphates, not the diguanamines. There also is no disclosure in Oishi et al that polyphosphates can be used as antimicrobial additives. Thus, Oishi et al does not teach what the Examiner alleges, and this is an additional reason why the rejection of claim 60 must fail.

In conclusion, Appellants have shown that the references were misinterpreted and improperly combined. Appellants have also shown that even if combined, Oishi et al and Endo et al could not teach, disclose, suggest or enable Appellants' invention. Finally, because Oishi et al and Endo et al teach away from the use of non-halogenated resins and non-halogenated fire retardants, Appellants have shown that their invention is not obvious in view of Oishi et al and Endo et al. Accordingly, Appellants respectfully submit that claims 30, 32, 34-47, 50-53, 55, and 57-61 are patentable over Oishi et al and Endo et al. and request withdrawal of this rejection.

2) Second Ground of Rejection

Claim 33 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Oishi et al. in view of Endo et al. and further in view of Perez et al. and in further view of Angell, Jr.

Claim 33 relates to the plastic pallet according to claim 30 comprising structural foam comprising an integral skin and cellular core.

Oishi et al. and Endo et al. do not render independent clam 30 obvious and Perez et al. (US 5,709,948) cannot cure their deficiencies. Perez et al discloses polymer networks of epoxy and polyolefin resins. Perez is cited because it discloses a composition that can be a foam (col. 23, lines 58-59 in the '948 patent is cited). Perez et al. discloses that the polymer network can be applied to a vessel at col. 3, lines 24-25. No pallets are disclosed, nor are any flame-retardants,

nor is the foam disclosed to be structural, and it is not clear how or why one skilled in the art would go about combining the teachings of Oishi et al, Endo et al, Perez et al. and Angell Jr.

The Final Rejection (March 7, 2006, page 7, six lines from the bottom of the page) says that any foam would be considered to be "structural" (a required feature of Appellants' claim 33). This statement is conclusory and is not supported by the reference. The fact that Perez et al. resinous compositions may be "applied" to a storage vessel (col. 3, lines 24-25 of Perez et al.) means that the resinous compositions are coatings. Such coatings would not be "structural". Also, see, for example, col. 23, lines 60 and 61 of Perez et al. where it states that the cured compositions of Perez et al. can be protective or decorative coatings on substrates. Thus, the Perez et al reference does not teach, disclose or suggest that any Perez et al. compositions can be used to prepare "structural" foams, much less structural foams for pallets. In contrast, Appellants discussed structural foam in their patent application (page 12, lines 4-7) where they say: "[w]hen structural foam is in the form of a pallet, it typically has rigidity for holding and transporting a load", and THE AMERICAN HERITAGE COLLEGE DICTIONARY, Houghton Mifflin company, Boston, MA (1993) p. 1347 defines "structural" as "a part of a structure that bears a weight or the structural piece used for such a part" (copy enclosed Appendix K). Both Appellants' application and one commonly understood meaning of the term "structural" support Appellants' position that the Perez et al. does not disclose, teach or suggest the use of its compositions as structural foams for use in plastic pallets. The Examiner cannot simply ignore this evidence and adopt an interpretation of the term that is contrary to Appellants' specification and claims or even a commonly accepted definition without a good reason (see Examiner's remarks on page 8, lines 13-17 of the Office Action mailed September 22, 2005). Statements from the Examiner to the effect that "any foam would be considered to be "structural" are conclusory, and in this instance unsupported. So Perez et al. does not teach what the Examiner alleges, and Perez et al cannot cure the deficiencies of Oishi et al and Endo et al to render claim 33 obvious.

Angell, Jr. relates to a method and apparatus for injection molded thermoplastic foamed articles (col. 1, lines 9-11 and 38-43, for example) such as bowling pins and insulated containers, and such as storage battery cases (col. 2, lines 49-51). No combinations of resins are taught or suggested. More particularly, no combinations of polyolefin and thermosetting resins are taught

or suggested and no pallets are taught or suggested. So Angell, Jr. does not cure the deficiencies of the Oishi et al and Endo et al references, nor do any of the cited references provide any reason, suggestion, or motivation for combining their teachings. Angell, Jr. was cited for its disclosure on a foamed polymeric material having a wall with a dense surface zone ("shell") and a cellular interior (Final Rejection, page 7, bottom paragraph). The "shell" of Angell, Jr. is defined as a "zone" that can vary in thickness, that can transition gradually from "shell" to "core", and that does not have a clearly defined line of demarcation between the "shell" and "core" (col. 2, lines 52-58). In contrast, Appellants' application describes the integral skin and cellular core of the structural foam (page 12, lines 4-7). The skin is normally solid, without voids or cells, and the core cellular. Clearly, this is not akin to the "shell" and "core" of Angell, Jr.

It is submitted that Appellants' polyolefin/thermosetting resin, non-halogenated flame retardant-containing pallet, as noted above, is patentable over Oishi et al. and Endo et al. and the additional references of Perez et al. and Angell, Jr. do not overcome their failure to teach, suggest or enable Appellants' plastic pallet. In addition to the arguments already provided with respect to the Oishi et al and Endo et al references, it is improper to use hindsight to selectively choose elements or concepts from the various references without regard to the teachings of the references as a whole and then combine them without a motivation, teaching or suggestion for such combination. The foam coating of Perez et al. and the "shell" and "core" of Angell, Jr. also do not teach or suggest Appellants' plastic pallet comprising structural foam where the foam composition has an integral skin and cellular core. Thus, Appellants respectfully submit that this rejection has been overcome and request withdrawal.

3) Third Ground of Rejection

Claim 46 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Oishi et al. in view of Endo et al. and further in view of Radican (US 6,148, 291). Radican is cited because it discloses RFID tags.

Claim 46 relates to a plastic pallet of the present invention further comprising at least one radio frequency identification (RFID) tag.

Radican relates to a container and inventory monitoring method and system for identifying inventory using RFID tags. There is no disclosure to use a combination of polyolefin

and thermosetting resins, nor is there any disclosure teaching the use of RFID tags on pallets. Such use is first disclosed in Appellants' application.

The deficiencies of Oishi et al and Endo et al already argued are sufficient to defeat this rejection. Radican does not cure those deficiencies. Radican is not combinable with Oishi et al and Endo et al, nor has the Examiner identified the teaching, motivation or suggestion for such combination. Once again, hindsight was used to selectively pick and choose teachings from various references and combine those teachings without a motivation or rationale or even a concern about whether the teachings could reasonably be combined. Accordingly, claim 46 is patentable over the references and this rejection should be withdrawn.

4) Fourth Ground of Rejection

Claim 64 stands rejected under 35 U.S.C. 103(a) as unpatentable over Oishi et al. in view of Endo et al. and further in view of Juhanson (US 4,655,360). Juhanson is cited because it discloses friction inserts.

Juhanson relates to a polyethylene non-skid case for carrying packaged soft drinks and the like. Contrary to the statement in the Final Rejection (March 7, 2006, page 9, lines 12-13) Juhanson does not teach a pallet. Friction inserts are used by Juhanson in the bottom of a case. Claim 48 relates to a plastic pallet and depends on claim 30. It further comprises friction material on at least one surface of the pallet.

Claim 64 is an independent claim that relates to a plastic pallet that is a molded pallet that further comprises in-mold applied friction material laminated, adhesive-free, to at least one surface of the pallet. Additionally, the pallet is made from a composition comprising polyolefin and epoxy resins.

The friction material of claim 64 is in-mold applied, which a distinct and unique feature that is not disclosed in Juhanson. However, in the Final Rejection (March 7, 2006) the Examiner indicates (see pages 10-11, bridging paragraph) that "in-mold applied" friction material is a method limitation and that it should be given no patentable weight. Appellants disagree and are not aware of any legal basis upon which such claim language can be ignored in determining patentability. It is well accepted in patent law that Congress has placed no limitations on how an applicant claims his invention so long as the specification concludes with claims that particularly point out and distinctly claim that invention. (*In re Steppan, Rebenstock, and Neugebauer*, 156

U.S.P.Q. 143 (C.C.P.A. 1967)). Further, where the chemical identity of a material is not critical, an applicant should be permitted to define that material in terms of its physical properties or the function that it performs. (*In re Metcalfe and* Lowe, 161, USPQ 789, 793 (CCPA 1969)). It is noted that in the present invention many different friction materials can be used, so clearly, the chemical identity of the friction material is not critical. It is submitted that all of the language in claim 64 is proper and should be given patentable weight in the prosecution of the instant patent application.

Further, although the abstract of the Juhanson patent states that the bottom of the case for carrying packaged soft drinks contains depressions in the lower surface of the bottom panel configured to entrap a portion of a high friction pad that is inserted therein, and Juhanson shows (see Figs. 4 and 5) a friction pad that is inserted in depressions in the lower surface of the bottom panel, Juhanson also states (col. 5, lines 22-26) that the pads may be compressed from the side by an appropriate tool for quick insertion into the depression or slot 62. So clearly, the pad is inserted after formation of the depression or slot. That means that the pad **is not** in-mold applied. So claim 64 is clearly distinguished from and not obvious in view of the Juhanson disclosure.

Juhanson also does not disclose, teach, suggest or enable a pallet containing the polyolefin/epoxy composition used to make the pallet of claim 64, so it does not cure the already noted deficiencies of the Oishi et al and Endo et al references.

Additionally, there is no teaching, motivation or suggestion that the teachings of Juhanson can or should be combined with those of Oishi et al and Endo et al, but even if there was, the combined references still would not disclose, teach, suggest or enable the pallets according to claims 48 and 64. So Appellants respectfully submit that this rejection is improper and request its withdrawal.

5) Fifth Ground of Rejection

Claim 49, dependent on claim 30, stands rejected under 35 U.S.C. 103(a) as unpatentable over Oishi et al. in view of Endo et al. and further in view of Radican and in further view of Juhanson. Radican is cited for RFID tags and Juhanson for friction material. Both of these references have been discussed above.

Claim 49 relates to the plastic pallet of the invention further comprising an antimicrobial additive, friction material on at least one surface of the pallet, and at least one RFID tag.

Appellants have already argued the patentability of claim 30 over Oishi et al. in view of Endo et al. Appellants have also distinguished over the Radican and Juhanson references. In connection with claim 35, Appellants have argued that Oishi et al does not teach, disclose, suggest or enable the use of a antimicrobial additive. In the context of this rejection, the Examiner has offered no suggestion, teaching, motivation for combining the teachings of these four references. However, even if the teachings of the cited references could somehow be combined, in view of the already enumerated deficiencies of Oishi et al and Endo et al that are not cured by Radican and/or Juhanson, one of ordinary skill in the art would not arrive at the claimed invention. Hence, Appellants respectfully submit that this rejection is improper and request its withdrawal. .

6) Sixth Ground of Rejection

Claims 56 and 63 stand rejected under 35 U.S.C. 103(a) as unpatentable over Oishi et al. in view of Endo et al. and further in view of Perez et al. Perez is cited because it discloses photoactivatable catalysts and thermal curatives.

Perez et al. has been discussed above in connection with claim 33 and those arguments are applicable to this rejection. Perez et al. discloses polymer networks of epoxy and polyolefin resins as well as various photoactivatable catalysts and thermal curatives.

Claim 56 relates to a plastic pallet according to the invention further comprising a photoactivatable catalyst selected from an onium salt photoinitiators and cationic organometallic complex salt. Claim 63 relates to the plastic pallet of the invention further comprising a thermal curative or photo catalyst.

The Office Action cited Perez et al. for its disclosure on photoactivatable catalysts. This disclosure, for reasons already discussed herein does not cure the deficiencies of the Oishi et al. and Endo et al. references and cannot, even when combined with those references, render the pallets of these claims obvious. Hence these rejections are in error and should be withdrawn.

7) Seventh Ground of Rejection

Claim 62 stands rejected under 35 U.S.C. 103(a) as unpatentable over Oishi et al. in view of Endo et al. and further in view of Ueeda et al. and further in view of Dyckman et al.

Claim 62 relates to a plastic pallet according to the invention further comprising an antibacterial additive selected from a group disclosed in the specification on page 19, lines 30-32.

Ueeda et al. discloses a plastic pallet produced from a polypropylene sheet and comprising an antimicrobial agent. No thermosetting resin is taught or suggested. It is submitted that Ueeda et al. does not overcome the essential failure, already discussed, of Oishi et al. and Endo et al. to teach, suggest or enable Appellant's plastic pallet comprising a combination of halogen-free polyolefin and thermosetting resins and non-halogenated flame retardant(s).

Dyckman et al. relates to an antimicrobial compound useful as a protective coating for ship bottoms and other submerged surfaces when incorporated in either a thermoplastic or thermosetting resin. This reference also does not cure the deficiencies of Oishi et al and Endo et al., and it provides no teaching, suggestion or motivation to use the disclosed antifouling agents in plastic pallets.

Hence Dyckman et al., Oishi et al., Endo et al., and Ueeda et al. do not disclose, teach, suggest or enable a plastic pallet as claimed in claim 62 and so this rejection is improper and should be withdrawn.

Additionally, no motivation can be found in the references for making the changes urged by the Office Action. It is improper to use hindsight to selectively choose elements or concepts from the various references, without considering the references as a whole, to arrive at the claimed invention by using the claims of Appellants' invention as a guide. Appellants respectfully request withdrawal of this rejection.

8) Eighth Ground of Rejection

Claim 65 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Oishi et al. in view of Endo et al. and further in view of Juhanson. Claim 65 relates to plastic pallets that are molded pallets comprising in-mold applied friction material. The arguments above pertaining to claims 64 are applicable to this rejection as well as the arguments regarding the combination of Oishi et al and Endo et al, above. Appellants respectfully submit that the cited references taken together do not render claim 65 unpatentable and request withdrawal of this rejection.

CONCLUSION

Appellants have shown that the rejections are improper because they are based on inaccurate interpretations of the references and hind-sight enabled combinations of bits and pieces of teachings from multiple references cobbled together without motivation, suggestion or teaching and without regard to whether or not such teachings can be combined at all. The

Examiner even relied on the Appellants' own disclosure to support the combination of otherwise unrelated references. Accordingly, the Examiner failed to support the obviousness rejections by making a proper, prima facie obviousness case. Additionally, Appellants have shown that neither Oishi et al nor Endo et al teach or disclose that halogen-free resins or fire retardants should be used. Instead, both Oishi et al and Endo et al teach away from that selection, and this deficiency is not cured by the other cited references. So even if the Examiner could establish a valid prima obviousness case based on the cited references, it would be successfully rebutted. Accordingly, the Appellants respectfully submit that the rejections should be withdrawn.

Respectfully submitted,

1/3/07

Date

By: _____

Eloise J. Maki, Reg. No.: 33,418
Telephone No.: 651-737-8459

Office of Intellectual Property Counsel
3M Innovative Properties Company
Facsimile No.: 651-736-3833

(J) Claims Appendix

1-29. (CANCELLED)

30. (Previously Presented) A flame-retardant containing plastic pallet comprising a plastic pallet composition comprising

a) one or more of polyolefin resins or blends thereof comprising 51 to 99 parts by weight of at least one of a fully prepolymerized uncrosslinked hydrocarbon polyolefin resin and a fully prepolymerized uncrosslinked functionalized polyolefin resin, the parts by weight being based on the total composition, wherein said hydrocarbon polyolefin is present in the range of 25 to 99 parts by weight of the total composition and said functionalized polyolefin is present in the range of 0 to 50 parts by weight of the total composition, and

b) one or more of thermosetting resins comprising 1 to 49 parts by weight of a curable thermosetting resin, the parts by weight being based on the total composition,

all of said resins being free of halogen,

wherein said plastic pallet contains at least one flame retardant, where all of the flame retardant(s) in said plastic pallet are selected only from the group consisting of non-halogenated flame retardants.

31. (CANCELLED)

32. (Previously Presented) The plastic pallet according to claim 30 wherein said thermosetting resin is an epoxy resin selected from the group consisting of epoxide, oxirane and ethoxyline resins having one or more of aliphatic, cycloaliphatic, and aromatic backbones

optionally having one or more of hydroxyl, acrylate, ethylenic unsaturation, and carboxylic acid ester functionality.

33. (Previously Presented) The plastic pallet according to claim 30 comprising structural foam comprising an integral skin and cellular core.

34. (Previously Presented) The plastic pallet according to claim 30 further comprising one or more of bubbles, glass fibers, and glass beads as fillers.

35. (Previously Presented) The plastic pallet according to claim 30 further comprising an antimicrobial additive.

36. (Previously Presented) The plastic pallet according to claim 30 wherein said flame retardant is selected from the group consisting of ammonium phosphates, compounds containing phosphorus-nitrogen bonds, and cyclic phosphates.

37. (Previously Presented) The plastic pallet according to claim 30 wherein said flame retardant is present in an amount in the range of more than zero and up to and including 25 parts by weight of the total polymeric composition.

38-45. (CANCELLED)

46. (Previously Presented) The plastic pallet according to claim 30 further comprising at least one radio frequency identification (RFID) tag.

47. (Previously Presented) The plastic pallet according to claim 30 further comprising one or more of performance enhancement additives selected from the group consisting of a friction material on at least one surface of said pallet, antimicrobial additives, mildewcides, foaming agents, and fillers.

48. (Previously Presented) The plastic pallet according to claim 30 further comprising a friction material on at least one surface of said pallet.

49. (Previously Presented) The plastic pallet according to claim 30 wherein

said plastic pallet further comprises at least one antimicrobial additive,

said plastic pallet further comprises friction material on at least one surface of said pallet, and

said plastic pallet further comprises at least one radio frequency identification (RFID) tag.

50. (Previously Presented) The plastic pallet according to claim 30 wherein said at least one prepolymerized uncrosslinked hydrocarbon and functionalized polyolefin resins are selected from the group consisting of homopolymers, copolymers, blends with other polyolefins, blends with high impact polymers and blends with rubbers or elastomers.

51. (Previously Presented) The plastic pallet according to claim 47 wherein said performance enhancement additives are present in the range of more than 0 to 70 parts by weight of the weight of the total composition.

52. (Previously Presented) The plastic pallet according to claim 30 wherein said thermosetting resin is selected from the group consisting of epoxy, curable polyolefins, ethylene propylene rubber, ethylene butylenes rubber, phenolics, polyurethanes, unsaturated polyesters, furan, allyls, vinyls, silicones, alkyds, nitrile rubber, and functionalized rubber.

53. (Previously Presented) The plastic pallet according to claim 30 wherein said thermosetting resin is an epoxy resin.

54. (CANCELLED)

55. (Previously Presented) The plastic pallet according to claim 30 wherein said one or more polyolefin resins are selected from the group consisting of alpha-olefins, copolymers of said alpha-olefins, and functionalized polyolefin wherein the functionalized groups include one or more of O, N, S, and P atoms.

56. (Previously Presented) The plastic pallet according to claim 30 wherein said plastic pallet composition further comprises a photoactivatable catalyst selected from the group consisting of an onium salt photoinitiator and a cationic organometallic complex salt.

57. (Previously Presented) The plastic pallet according to claim 30 wherein said plastic pallet composition further comprises a thermal curing agent selected from the group consisting of aliphatic or aromatic primary, secondary, or tertiary amines, boron trifluoride complexes, imidazoles, hydrazines, and guanidines.

58. (Previously Presented) The plastic pallet according to claim 30 wherein said polymeric composition is cured.

59. (Previously Presented) The plastic pallet according to claim 58 which comprises a semi-interpenetrating polymer network.

60. (Previously Presented) The plastic pallet according to claim 35 wherein said antimicrobial additive is integrally associated with said container and is substantially insoluble in water.

61. (Previously Presented) The plastic pallet according to claim 60 wherein said antimicrobial additive is selected from the group consisting of mildewcides, antiseptics, disinfectants, sanitizers, germicides, algaecides, slimicides, antifouling agents, biocides, and preservatives.

62. (Previously Presented) A flame-retardant containing plastic pallet composition comprising

a) one or more of polyolefin resins or blends thereof, and

b) one or more of thermosetting resins,

all of said resins being free of halogen,

wherein said plastic pallet contains at least one flame retardant, where all of the flame retardant(s) in said plastic pallet are selected only from the group consisting of non-halogenated flame retardants,

said plastic pallet further comprising an antimicrobial additive that is integrally associated with said plastic pallet and is substantially insoluble in water, said antimicrobial additive being selected from the group consisting of mildewcides, antiseptics, disinfectants, sanitizers, germicides, biocides, and preservatives.

63. (Previously Presented) A flame-retardant containing plastic pallet comprising a plastic pallet composition comprising

a) one or more of polyolefin resins or blends thereof comprising 51 to 99 parts by weight of at least one of a fully prepolymerized uncrosslinked hydrocarbon polyolefin resin and a fully prepolymerized uncrosslinked functionalized polyolefin resin, the parts by weight being based on the total composition, wherein said hydrocarbon polyolefin is present in the range of 25 to 99 parts by weight of the total composition and said functionalized polyolefin is present in the range of 0 to 50 parts by weight of the total composition, and

b) one or more of thermosetting resins comprising 1 to 49 parts by weight of a curable thermosetting resin, the parts by weight being based on the total composition,

all of said resins being free of halogen,

wherein said plastic pallet contains at least one flame retardant, where all of the flame retardant(s) in said plastic pallet are selected only from the group consisting of non-halogenated flame retardants,

said plastic pallet composition further comprising a thermal curative or a photocatalyst.

64. (Previously Presented) A flame-retardant containing plastic pallet comprising a plastic pallet composition comprising

a) one or more of polyolefin resins or blends thereof comprising 51 to 99 parts by weight of an least one of a fully prepolymerized uncrosslinked hydrocarbon polyolefin resin and a fully prepolymerized uncrosslinked functionalized polyolefin resins, the parts by weight being based on the total composition, wherein said hydrocarbon polyolefin is present in the range of 25 to 99 parts by weight of the total composition and said functionalized polyolefin is present in the range of 0 to 50 parts by weight of the total composition , and

b) one or more of epoxy resins comprising 1 to 49 parts by weight of a curable epoxy resin, the parts by weight being based on the total composition,

all of said resins being free of halogen,

wherein said plastic pallet is a molded pallet that contains at least one flame retardant, where all of the flame retardant(s) in said plastic pallet are selected only form the group consisting of non-halogenated flame retardants, and

wherein said molded plastic pallet further comprises in-mold applied friction material laminated adhesive-free to at least one surface of said pallet.

65. (Previously Presented) A flame-retardant containing plastic pallet comprising a plastic pallet composition comprising

a) one or more of polyolefin resins or blends thereof, and

b) one or more of thermosetting resins,

all of said resins being free of halogen, and

wherein said plastic pallet comprises one or more molded member(s),

wherein one or more of said molded members comprises in-mold applied friction material on at least one surface of said molded member(s), and

wherein said plastic pallet contains at least one flame retardant, where all of the flame retardant(s) in said plastic pallet are selected only from the group consisting of non-halogenated flame retardants.

(K) Evidence Appendix

Dictionary Definition of "structural":

(I) THE AMERICAN HERITAGE COLLEGE DICTIONARY, Houghton Mifflin Company, Boston, MA (1993) p. 1347.

Entered in the record through the Amendment and Response dated October 21, 2003, page 6.

Sperling reference on semi-interpolymer networks:

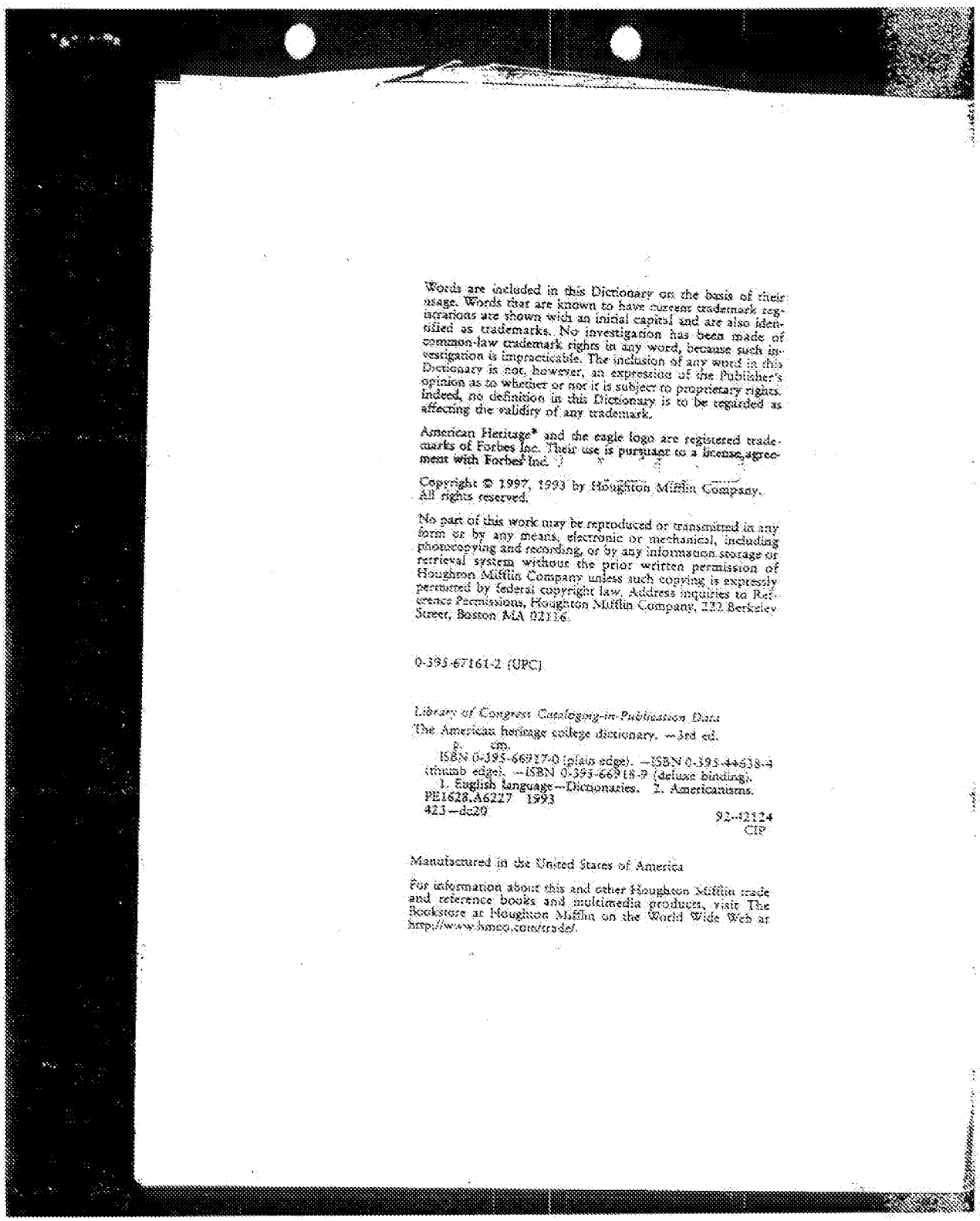
(II) L. H. Sperling, INTRODUCTION TO PHYSICAL POLYMER SCIENCE, Third Edition, Wiley-Interscience, New York, N.Y. (2001) pp. 46-47.

Entered in the record through the Amendment and Response dated August 26, 2004, page 10.



THE AMERICAN HERITAGE® COLLEGE DICTIONARY

THIRD EDITION



Words are included in this Dictionary on the basis of their usage. Words that are known to have current trademark registrations are shown with an initial capital and are also identified as trademarks. No investigation has been made of common-law trademark rights in any word, because such investigation is impracticable. The inclusion of any word in this Dictionary is not, however, an expression of the Publisher's opinion as to whether or not it is subject to proprietary rights. Indeed, no definition in this Dictionary is to be regarded as affecting the validity of any trademark.

American Heritage® and the eagle logo are registered trademarks of Forbes Inc. Their use is pursuant to a license agreement with Forbes Inc.

Copyright © 1997, 1993 by Houghton Mifflin Company.
All rights reserved.

No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system without the prior written permission of Houghton Mifflin Company unless such copying is expressly permitted by federal copyright law. Address inquiries to Reference Permissions, Houghton Mifflin Company, 222 Berkeley Street, Boston MA 02116.

0-395-67161-2 (UPC)

Library of Congress Cataloging-in-Publication Data
The American heritage college dictionary. —3rd ed.
p. cm.
ISBN 0-395-66917-0 (plain edge). —ISBN 0-395-44638-4 (thumb edge). —ISBN 0-395-66918-9 (deluxe binding).
1. English language—Dictionaries. 2. Americanisms.
PE1628.A6227 1993
423—dc20 92-42124
CIP

Manufactured in the United States of America

For information about this and other Houghton Mifflin trade and reference books and multimedia products, visit The Bookstore at Houghton Mifflin on the World Wide Web at http://www.hmco.com/trade/.



1347

strong interaction

Stuart

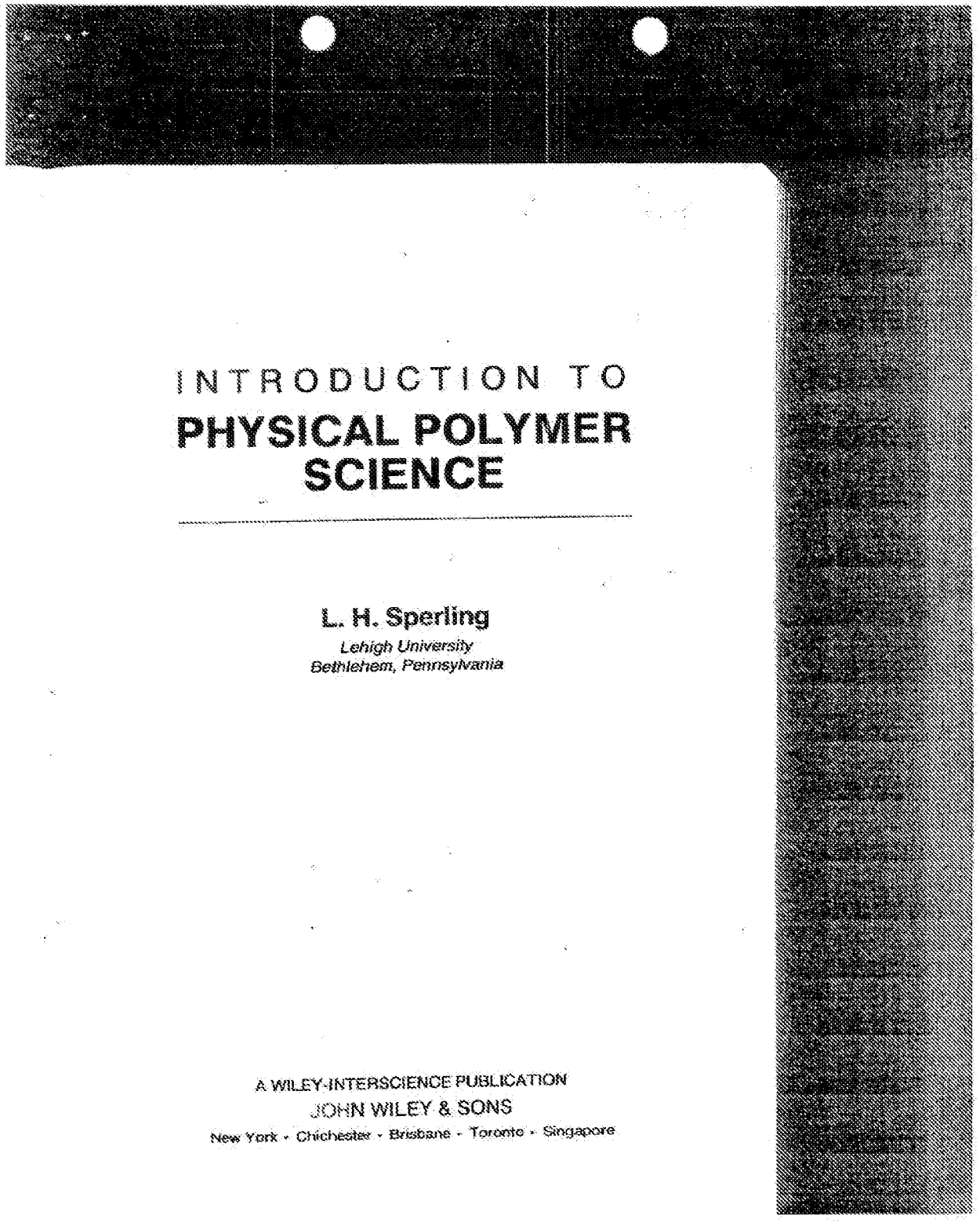
assessed or occupied by a group or matched by a quality.
strong interaction *n.* A fundamental interaction between elementary particles that causes protons and neutrons to bind together in the atomic nucleus.
strong·man (strông′măn′) *n.* 1. A powerful influential political figure who exercises leadership and control by force. 2. One who performs feats of strength, as at a circus.
strong-mind·ed (strông′mīn′dĭd) *adj.* 1. Having a determined will. 2. Having a vigorous, independent mind. — **strong′-mind′ed·ly** *adv.* — **strong′-mind′ed·ness** *n.*
strong point (strông′ point′) *n.* A military stronghold.
strong room *n.* A strongly built fireproof room designed for the safekeeping of money or valuables.
strong side *n. Football.* The side of a formation having more players; the side on which the tight end is positioned.
strong suit *n.* 1. A quality, an activity, or a skill in which a person excels. 2. *Games.* A long suit in a card game such as bridge that contains high cards.
Stron·ghe·lis (strông′gə-lĭs) A city of NE OH, a suburb of Cleveland. Pop. 35,308.
stron·gyle also **stron·gyl** (strŏn′jĭl′, -jəl) *n.* Any of various nematode worms of the family Strongylidae, often parasitic in the gastrointestinal tract of mammals, esp. horses. [NLat. *Strongylus*, type genus < Gk. *strongulos*, round.]
stron·gy·lo·sis (strŏn′jə-lō′sĭs) *n.* Infestation with strongyles.
stron·ti·an·ite (strŏn′shē-ə-nīt′, -shən-īt′) *n.* A gray to yellowish-green ore of strontium, $SrCO_3$. [< *strontium*, strontianite, ultimately after *Strontian* in W-central Scotland.]
stron·ti·um (strŏn′shē-əm, -tē-əm, -chəm) *n. Symbol Sr* A soft, easily oxidized metallic element that ignites spontaneously in air, when finely divided, and is used in pyrotechnic compounds and various alloys. Atomic number 38; atomic weight 87.62; melting point 769°C; boiling point 1,384°C; specific gravity 2.54; valence 2. See table at **element**. [< NLat. *strontia*, strontium oxide < *strontian*. See STRONTIANITE.]
— **stron′tic** (-tĭk) *adj.*
strontium 90 *n.* The strontium isotope with mass 90, having a half-life of 28 years, that is a high-energy beta emitter and constitutes a radiation hazard in fallout.
strop (strŏp) *n.* 1. A strap, esp. a short rope whose ends are spliced together to make a ring. 2. A flexible strip of leather or canvas used for sharpening a razor. — *tr.v.* **stropped**, **strop·ping**, **strops**. To sharpen (a razor) on a strop. [ME *stroppe*, band of leather, prob. < OE, thong for an oar < Lat. *struppus*, twisted cord < Gk. *strophos* < *strephein*, to turn. See STREB(H)-.]
stro·phan·thin (strə-făn′thĭn) *n.* A toxic glycoside or mixture of glycosides obtained from the seeds of certain plants of the genus *Strophanthus*, esp. *S. kombe*, used medicinally as a cardiac stimulant. [NLat. *Strophanthus*, genus name (Gk. *strophos*, twisted cord; see STROP + Gk. *anthos*, flower) + -IN.]
stro·phe (strō′fē) *n.* 1.a. The first of a pair of stanzas of alternating form on which the structure of a given poem is based. b. A stanza containing irregular lines. 2. The first division of the triad constituting a section of a Pindaric ode. 3.a. The first movement of the chorus in classical Greek drama, the whole turning from one side of the orchestra to the other. b. The part of a choral ode sung while this movement is executed. [Gk. *strophē*, a turning, stanza < *strephein*, to turn. See STREB(H)-.] — **stro·phic** (strō′fĭk, strŏf′ĭk) *adj.*
stro·phoid (strō′foid′) *n.* A plane curve generated by a point that maintains a distance from the *y*-axis along a straight line equal to the *y*-intercept. [Gk. *strophos*, twisted cord (< *strephein*, to turn; see STREB(H)-) + -OID.]
Stroph·u·lus (strŏf′yə-ləs) *n., pl.* **-li** (-lī′). A disease, common esp. among children, sometimes associated with intestinal disturbances and characterized by a papular eruption of the skin. [NLat. < Gk. *strophilos*, twisted cord < *strephein*, to turn. See STREB(H)-.]
strop·py (strŏp′ē) *adj.* **-pi·er**, **-pi·est**. *Chiefly British.* Easily offended or annoyed; ill-tempered or belligerent. [Perh. alteration of OBSTREPEROUS.]
stroud (stroud) *n.* A coarse woolen cloth or blanket. [After *Stroud*, an urban district of SW-central England.]
strove (strōv) *v.* P.t. of STRIVE.
struck (strŭk) *v.* P.t. and p.part. of STRIKE. — *adj.* Affected or shut down by a labor strike.
struc·tur·al (strŭk′chər-əl) *adj.* 1.a. Of, relating to, having, or characterized by structure. b. Affecting structure. 2. Used for or necessary to building. 3. Concerned with or resulting from political or esp. economic structure. 4. *Geol.* Of or relating to the structure of rocks and other aspects of the earth's crust. 5. *Biol.* Of or relating to organic structure; morphological. 6. Relating to or concerned with systematic structure in a field of study, such as linguistics or the behavioral sciences. — *n.* A part of a structure that bears a weight or the structural piece used for such a part. — **struc′tur·al·ly** *adv.*
structural formula *n.* A chemical formula that shows how the atoms and bonds in a molecule are arranged.
structural gene *n.* A gene that determines the amino acid sequence of a protein.
struc·tur·al·ism (strŭk′chər-ə-lĭz′əm) *n.* 1. A method of analyzing phenomena, as in linguistics or psychology, marked by contrasting the elemental structures of the phenomena in a system of binary opposition. 2. A school that advocates and employs such a method. — **struc′tur·al·ist** *adj.* & *n.*
struc·tur·al·ize (strŭk′chər-ə-līz′) *tr.v.* **-ized**, **-iz·ing**, **-iz·es**. To form, organize, or incorporate into a structure. — **struc′tur·al·i·za′tion** (-ə-lĭ-zā′shən) *n.*
structural linguistics *n.* (*used with a sing. v.*) 1. A method of synchronic linguistic analysis employing structuralism, esp. in concentrating about formal structures, such as phonemes or sentences, that make up systems, such as phonology or syntax. 2. A school of such a method of linguistics, developed in the United States from the 1930's to the 1950's.
structural steel *n.* Steel shaped for use in construction.
struc·ture (strŭk′chər) *n.* 1. Something made up of a number of parts that are held or put together in a particular way. 2. The way in which parts are arranged or put together to form a whole; makeup. 3. The interrelation or arrangement of parts in a complex entity. 4. Something constructed. 5. *Biol.* a. The arrangement or formation of the tissues, organs, or other parts of an organism. b. An organ or other part of an organism. — *tr.v.* **-tured**, **-tur·ing**, **-tures**. To give form or arrangement to. [ME, the process of building < Lat. *structūra* < *structus*, p.part. of *struere*, to construct. See STRU-².]
struc·tured (strŭk′chərd) *adj.* 1. Highly organized. 2. *Psychol.* Having a limited number of correct or nearly correct answers. Used of a test.
structured programming *n. Comp. Sci.* A method of designing and writing programs in which the statements are organized to minimalize error or misinterpretation.
strud·del (strōod′l, shtrōod′l) *n.* A pastry made with fruit or cheese rolled up in a thin sheet of dough and then baked. [Ger. < MHGer., whirlpool.]
strug·gle (strŭg′əl) *n.* **-gled**, **-gling**, **-gles**. — *intr.* 1. To exert muscular energy, as against a material force or mass. 2. To be strenuously engaged with a problem, a task, or an undertaking. 3. To make a strenuous effort; strive. 4. To contend or compete. 5. To progress with difficulty. — *n.* 1. The act of struggling. 2. Strenuous effort; striving. 3. Combat; strife. [ME *struglen*.] — **strug′gler** *n.* — **strug′gling·ly** *adv.*
strum (strŭm) *v.* **strummed**, **strum·ming**, **strums**. — *tr.* 1. To play (a stringed musical instrument) by striking or brushing the strings. 2. To play (music) in this way. — *intr.* To strum a stringed instrument. — *n.* The act or sound of strumming. [Perh. imit.] — **strum′mer** *n.*
stru·ma (strōō′mə) *n., pl.* **-mae** (-mē′) or **-mas**. 1.a. See SCROFULA. b. See GOITER. 2. *Bot.* A cushionlike swelling at a moss capsule base. [Lat. *struma*, scrofulous tumor.] — **stru·mat′ic** (-măt′ĭk) *adj.* **stru′mose** (-mōs′), **stru′mous** (-məs) *adj.*
Stru·ma (strōō′mə) A river of W Bulgaria and NE Greece flowing c. 348 km (216 mi) to the Aegean Sea.
strum·pet (strŭm′pĭt) *n.* A prostitute. [ME.]
strung (strŭng) *v.* P.t. and p.part. of STRING. — *adj.* Tense or exhausted.
strung-out (strŭng′out′) *adj. Slang.* 1.a. Suffering from an addiction to a drug. b. Addicted to a drug. 2.a. Debilitated from long drug use. b. Physically or emotionally exhausted.
strut (strŭt) *v.* **strut·ted**, **strut·ting**, **struts**. — *intr.* To walk with pompous bearing; swagger. — *tr.* 1. To display in order to impress others. 2. To brace with a supporting bar or rod. — *n.* 1. A pompous self-important gait. 2. A bar or rod used to brace a structure against forces applied from the side. — **idiom. strut (one's) stuff.** *Slang.* To behave or perform ostentatiously; show off. [ME *strouten*, to stand out < OE *strūtian*, to stand out stiffly. See STER-³.] — **strut′ter** *n.*
stru·thi·ous (strōō′thē-əs, strōō′-) *adj.* Of, relating to, or resembling an ostrich or a related bird; ratite. [< Lat. *struthio*, ostrich < Gk. *struthiōn* < Gk. *struthos*.]
strych·nine (strĭk′nīn′, -nĭn, -nēn′) *n.* An extremely poisonous crystalline alkaloid, $C_{21}H_{22}O_2N_2$, derived from nux vomica and related plants and used as a poison for rodents and other pests and topically in medicine as a stimulant for the central nervous system. [Fr. < NLat. *Strychnos*, genus name < Lat. *strychnos*, a kind of nightshade < Gk. *strukhnos*.]
strych·nism (strĭk′nĭz′əm, -nĭs, -nēz′) *n.* A pathological condition induced by strychnine poisoning.
Stu·art (stōō′ərt, styōō′-). Ruling house of Scotland (1371–1603) and of England and Scotland (1603–49 and 1660–1714).
Stuart, Charles Edward. "the Young Pretender." 1720–88. Pretender to the British throne who led the last Jacobite rising (1745–46) but was defeated in battle and died in France.
Stuart, Gilbert Charles. 1755–1828. Amer. painter particularly known for his portraits of George Washington.
Stuart, Henry. See Lord Darnley.
Stuart, James Ewell Brown ("Jeb"). 1833–64. Amer. Confederate general who was mortally wounded during the Wilderness Campaign (1864).
Stuart, James (Francis) Edward. "the Old Pretender." 1688–1766. Pretender to the British throne who made two attempt-

Gilbert Stuart
Self-portrait

J.E.B. Stuart
Photographed in the early 1860's

ă pat	oi toy
ā pay	oo out
âr care	ŏŏ book
ä father	ōō boot
ĕ pet	ŭ cut
ē be	ûr urge
ĭ pit	th thin
ī pie	th this
îr pier	hw which
ŏ pot	zh vision
ō toe	ə about,
ô paw	item

Stress marks:
ˈ (primary);
ˌ (secondary), as in dictionary (dĭk′shə-nĕr′ē)

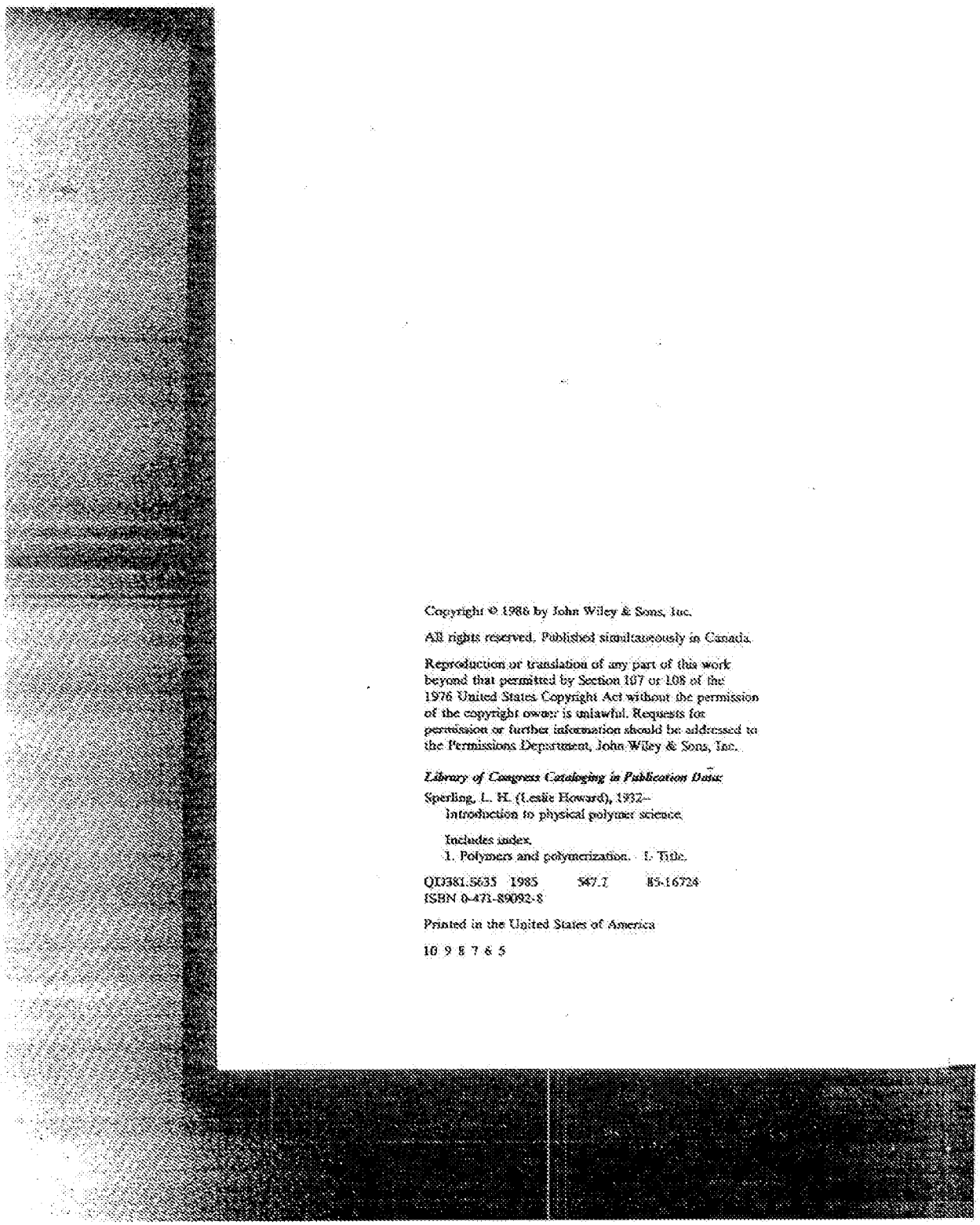


INTRODUCTION TO

PHYSICAL POLYMER SCIENCE

L. H. Sperling
Lehigh University
Bethlehem, Pennsylvania

A WILEY-INTERSCIENCE PUBLICATION
JOHN WILEY & SONS
New York · Chichester · Brisbane · Toronto · Singapore



Copyright © 1986 by John Wiley & Sons, Inc.

All rights reserved. Published simultaneously in Canada.

Reproduction or translation of any part of this work beyond that permitted by Section 107 or 108 of the 1976 United States Copyright Act without the permission of the copyright owner is unlawful. Requests for permission or further information should be addressed to the Permissions Department, John Wiley & Sons, Inc.

Library of Congress Cataloging in Publication Data:

Sperling, L. H. (Leslie Howard), 1932–
Introduction to physical polymer science.

Includes index.
1. Polymers and polymerization. I. Title.

QD381.S635 1985 547.7 85-16724
ISBN 0-471-89092-8

Printed in the United States of America

10 9 8 7 6 5

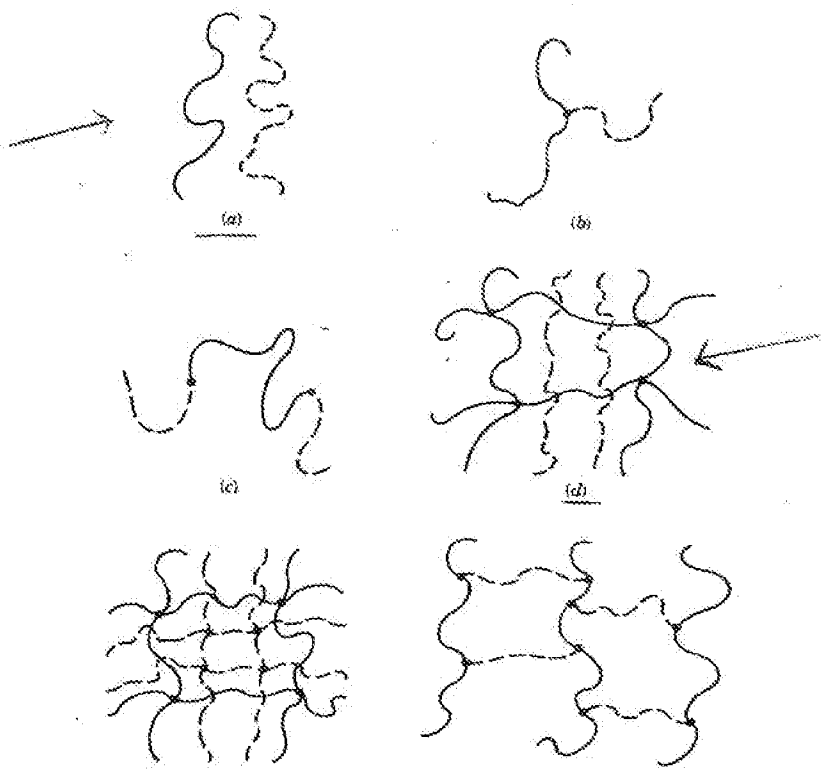


FIGURE 2.9 Six basic modes of linking two or more polymers are identified (19). (*a*) A polymer blend, constituted by a mixture or mutual solution of two or more polymers, not chemically bonded together. (*b*) A graft copolymer, constituted by a backbone of polymer I with covalently bonded side chains of polymer II. (*c*) A block copolymer, constituted by linking two polymers end on end by covalent bonds. (*d*) A semiinterpenetrating polymer network constituted by an entangled combination of two polymers, one of which is cross-linked, and are not bonded to each other. (*e*) An interpenetrating polymer network, abbreviated IPN, is an entangled combination of two cross-linked polymers that are not bonded to each other. (*f*) A contermimously linked polymer, constituted by having the polymer II species linked, at both ends, onto polymer I. The ends may be grafted to different chains or the same chain. The total product is a network composed of two different polymers.

48

mer being present. To some extent, then, the term graft copolymer may also mean, "polymer *B* synthesized in the immediate presence of polymer *A*." Only by a reading of the context can the two meanings be distinguished.

2.7.3 Conterminously Grafted Copolymers

The polymers of Section 2.7.2 are soluble, at least in the ideal case. A conterminously grafted polymer has polymer *B* grafted at both ends, or at various points along the structure to polymer *A*, and hence it is a network and not soluble. (See structure *F* in Figure 2.9.)

2.7.4 Interpenetrating Polymer Networks

This is an intimate combination of two polymers in network form. At least one of the polymers is polymerized and/or cross-linked in the immediate presence of the other (22). While ideally the polymers should interpenetrate on the molecular level, actual interpenetration may be limited owing to phase separation. (Phase separation in polymer blends, grafts, blocks, and interpenetrating polymer networks is the more usual case, and is discussed in Chapter 4.)

2.7.5 Other Polymer–Polymer Combinations

According to new proposed nomenclature, a polymer blend would be accorded the connective *–blend–*. Many of these blends are prepared by highly sophisticated methods and are actually on a parallel with the blocks, grafts, and interpenetrating polymer networks.

Block copolymers may also be arranged in various star arrangements. In this case, polymer *A* radiates from a central point, with a number of arms to be specified. Then polymer *B* is attached to the end of each arm.

2.7.6 Separation and Identification of Multicomponent Polymers

The methods of separation and identification of multicomponent polymers are far different from the methods described above for the statistical type of polymer. First of all, only the blends are separable by extraction techniques. The remainder are bound together by either chemical bonds or interpenetration. The interpenetrating polymer networks and the conterminously grafted polymers are insoluble in all simple solvents and do not flow on heating. The graft and block copolymers, on the other hand, do dissolve, and flow on heating above T_f and/or T_g.

Most, but not all, of the multicomponent polymer combinations exhibit some type of phase separation, which will be discussed in Chapter 4. Where the polymers are stainable and observable under the electron microscope, characteristic morphologies are often manifest. The principal polymers that are stainable include the diene types and those containing ester groups. For those

(L) Related Proceedings Appendix

NONE